32. The liquid-crystal display of claim 31, wherein said method of obtaining each of said dry deposited layers comprises: treating a dry deposited layer with an ion beam in a direction making from about 10 to about 20 degree angle with the plane of the electrodes.

34. The liquid-crystal display of claim 1, wherein said particle beam in is directed at said dry deposited layer at an angle from about 10 to about 20 degree angle with the plane of the electrodes.

35. The liquid-crystal display of claim 9, wherein said particle beam in is directed at said dry deposited layer at an angle from about 10 to about 20 degree angle with the plane of the electrodes.

36. The liquid-crystal display of claim 30, wherein said particle beam in is directed at said dry deposited layer at an angle from about 10 to about 20 degree angle with the plane of the electrodes.

REMARKS

Attached hereto is a marked-up version of the changes made to the specification and to the claims by the current amendments. The attached pages are captioned "**Version with Markings to Show Changes Made.**"

Claims 2, 3 and 34 to 36 are cancelled.

The Final Action has objected to the specification because the phrases "dry deposited liquid-crystal alignment layer" and "dry deposited layer" appear to refer to different layers of a multi-domain liquid-crystal display. In response, Applicants have amended the specification to clearly recite a "dry deposited layer" in all instances, for

purposes of clarity. Applicants have also amended claims 4, 10 to 11, 18, 22, 26, and 32 to 36 to clearly recite a "dry deposited layer".

The Final Action has rejected claims 3 and 12 under 35 U.S.C. § 112, second paragraph, as being indefinite. Specifically, Final Action states that the limitation "said material" in claims 3 and 12 lacks antecedent basis. Claim 3 is cancelled. Accordingly, the rejection of claim 3 is moot. Applicants respectfully point out that antecedent basis for "said material" in dependant claim 12 is found in claim 11, from which claim 12 depends. Claim 11 clearly recites in line 19 "depositing on a substrate *a material* to form a transparent dry deposited layer" (emphasis added). Accordingly, claim 12 has not been amended.

Claims 1-3 and 34 were rejected under 35 U.S.C. § 102(e) as being anticipated by U.S. Patent 6,061,114 to Callegari et al. (hereinafter "Callegari"). Claims 2, 3 and 34 have been cancelled, accordingly the rejection of claims 2, 3 and 34 is moot.

Callegari is cited by the Final Action for teaching a method of preparing a multi-domain dry deposited liquid-crystal alignment layer using mechanical mask and ion beam treatments. Applicants respectfully point out that Callegari does not teach a method of preparing a multi-domain liquid crystal display using a dry deposit alignment layer and two or more alignment methods selected from the group consisting of: mechanical mask, photo-resist, UV treatment and ridge and fringe field, as is now clearly claimed in claim 1. In fact, Callegari teaches away from the use of photo resist and UV irradation alignment methods, which are traditionally used with polymer film technique rather than dry deposition technique. Callegari cites such methods as "very expensive and time consuming . . .[and] containing a large number of processing steps, which creates more possibility for error, lower device yields, and increases in fabrication time and device cost." (column 1, lines 27 – 33).

Moreover, Callegari is directed to a twisted neumatic liquid crystal display device (see column 3, lines 24 to 26). Claim 1 is now clearly directed to a multi domain liquid crystal display, which is operable in the in-plane switching mode. For at least these reasons, claim 1 is clearly not anticipated by Callegari. Accordingly, the rejection of claim 1 under 35 U.S.C. § 102(e) should be withdrawn and claim 1 should be allowed.

Claims 1 and 4 to 7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,124,914 to Chaudhari et al. (hereinafter "Chaudhari") in view of Callegari.

Applicants respectfully submit that the combination of Chaudhari and Callegari neither describes nor suggests all of the elements of the present invention, as claimed in independent claim 1. Chaudhari teaches a method of using a polyamide alignment film layer in combination with a photo resist or UV alignment technique to form a single domain liquid crystal display device. There is no teaching or suggestion in Chaudahari for a multi-domain device, a dry deposited alignment film, or for ridge and fringe treatment methods, as claimed in claim 1.

As discussed above, Callegari teaches a method of using a dry deposit alignment layer and ion beam treatment. There is no teaching in Callegari for application of UV, photo-resist or ridge and fringe field treatment methods to a dry deposited alignment film. In contrast, as discussed, Callegari teaches away from the use of photo-resist and UV irradation treatments traditionally used with polyamide films. (column 1, lines 27 – 33). Accordingly, there is no for teaching in either Chaudhari or Callegari for a method of preparing a multi-domain liquid crystal display comprising a step of aligning the dry deposited layer using at least two methods selected from the group consisting of: mechanical mask, photo-resist, UV treatment, and ridge and fringe field treatments.

Moreover, claim 1 now clearly claims a multi-domain liquid crystal display that is operable in the in-plane switching mode. Neither Chaudahari nor Callegari disclose a liquid crystal display that is operable in the in-plane switching mode. In contrast, both Chaudahari and Callegari are directed to twisted nematic type cells. Thus, the combination of Chaudhari and Callegari does not teach or suggest all the limitations of the instant claims.

In order to establish a proper *prima facie* case of obviousness, it is required that the combination of references teaches or suggests all the limitations of the claim in question. Since the combination of Chaudhari and Callegari does not teach or suggest all the limitations of claim 1, it does not render claim 1 obvious. Accordingly, the rejections of claim 1 and claims 4 to 7, which depend directly or indirectly therefrom under 35 U.S.C. § 103(a) should be withdrawn and claim 1 and claims 4 to 7 should be allowed.

Claims 1, 8 and 26 to 28 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,256,080 to Colgan et al (hereinafter "Colgan") in view of Callegari.

Applicants respectfully submit that the combination of Colgan and Callegari neither describes nor suggests all of the elements of the present invention claimed in independent claims 1 and 9. Claims 1 and 9 clearly recite a method of preparing a multi-domain liquid crystal display comprising a step of aligning the dry deposited layer using at least two methods selected from the group consisting of: mechanical mask, photo-resist, UV treatment, and ridge and fringe field treatments. Colgan is directed to a method of producing a single domain liquid-crystal display, wherein the alignment layer is a polyamide. Colgan does not teach a method of producing a multi-domain liquid crystal display, much less a multi-domain liquid-crystal display formed using a dry deposited alignment layer, as is clearly recited in independent claims 1 and 9.

Additionally, Colgan does not teach UV or ridge and fringe field treatments for aligning the polyamide layer.

As discussed above, Callegari teaches a method of using a dry deposit alignment layer and ion beam treatment. There is no teaching in Callegari for application of UV, photo-resist or ridge and fringe field treatment methods to a dry deposited alignment film. In contrast, for the reasons discussed above, Callegari teaches away from the use of photo-resist and UV treatments traditionally used with polyamide films. Accordingly, there is no suggestion in Callegari for combining Colgan and Callegari.

In summary, Applicants respectfully submit that independent claims 1 and 9 are patentably distinguishable over the Colgan patent and the Callegari patents, either alone or in combination. Claim 8 depends from claim 1, so it is patentably distinguishable for at least the same reason as claim 1. Claims 26 to 28 depend from claim and 9, so they are also patentably distinguishable for at least the same reasons as claim 9. Applicants respectfully request reconsideration and withdrawal of the section 103 rejection of claims 1, 8, and 26 to 28.

Claims 9 to 20, 22 to 25, 29 to 30 and 35 to 36 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 6,124,914 to Chaudhari et al. (hereinafter "Chaudhari") in view of Callegari.

Applicants respectfully submit that the combination of Chaudhari and Callegari neither describes nor suggests all of the elements of the present invention. Claims 9, 29 and 30 are directed to a multi-domain liquid crystal display wherein alignment of a dry deposited liquid crystal alignment layer is obtained by a method selected from the group consisting of: mechanical mask, photo-resist, UV treatment and ridge and fringe field methods. As discussed above, Chaudhari teaches the use of a polyamide alignment film layer for forming a single domain liquid crystal display device.

Callegari teaches a method of using a dry deposit alignment layer and ion beam treatment. There is no teaching in Callegari for application of UV, photo-resist or ridge and fringe field treatment methods in combination with a dry deposited alignment film. For the reasons discussed above, Callegari teaches away from the use of photo-resist and UV treatments traditionally used with polyamide films. Accordingly, there is no suggestion in Callegari for combining Chaudhari and Callegari.

As such, even if the teachings of the Chaudahari and Callegari patents were somehow combined, as attempted by the Examiner, the resulting combination would still be deficient in teaching or suggesting the claimed subject matter. Thus, the combination of Chaudhari and Callegari does not teach or suggest all the limitations of the instant claims.

As mentioned above, to establish a proper *prima facie* case of obviousness, it is required that the combination of references teaches or suggests all the limitations of the claim in question. Since the combination of Chaudahari and Callegari does not teach or suggest all the limitations of independent claims 9, 29 and 30, the combination therefore does not render claims 9, 29 and 30 obvious. Accordingly, the rejections of claim 9, claims 10 to 20, 22 to 25, which depend directly or indirectly therefrom, and claims 29 and 30 under 35 U.S.C. § 103(a) should be withdrawn.

Claims 31 to 33 were rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,949,509 to Ohe et al (hereinafter "Ohe") in view of Callegari.

Applicants respectfully submit that the combination of Ohe and Callegari neither describes nor suggests all of the elements of claim 31. Claim 31 is directed to a wide viewing angle in-plane switching mode liquid-crystal display. Claim 21 further requires a dry deposited alignment layer and ion beam treatment. As conceded by the Action, Ohe fails to disclose a dry deposited alignment layer. In contrast, the alignment layer

taught by Ohe is a polyamide film. As such, Ohe is deficient in teaching or suggesting the claimed subject matter of claim 31.

Callegari also fails to teach or suggest the claimed subject matter of claim 31. Callegari is not directed to an in-plane device. Rather, Callegari is directed to a twisted nematic type liquid crystal display (see column 3, lines 24 to 27). Moreover, there is no teaching in Callegari for application ion beam treatment methods to create an in-plane liquid crystal device. Accordingly, there is no suggestion in Callegari for combining Ohe and Callegari, absent hindsight from Applicants' invention.

In summary, Applicants respectfully submit that independent claim 31 is patentably distinguishable over the Ohe and Callegari patents, taken either alone or in combination. Claims 32 and 33, which depend from claim 31, are patentably distinct over the Ohe and Callegari combination for at least the same reasons as claim 31. Applicants respectfully request reconsideration and withdrawal of the section 103 rejection of claims 31 to 33.

Based on the above, applicants respectfully request reconsideration of the present application, withdrawal of the objections, the 35 U.S.C.112, second paragraph rejection, the 35 U.S.C. § 102(e), and the 35 U.S.C. § 103(a) rejections, and allowance of claims 1, 4 to 20 and 22 to 36. Accordingly, an indication of the allowability of all pending claims by issuance of a Notice of Allowability is earnestly solicited.

Respectfully submitted,

Date: December 20, 2002 By: _____

Paul D. Greeley
Reg. No. 31,019
Attorney for Applicants
Ohlandt, Greeley, Ruggiero
& Perle, L.L.P.
One Landmark Square, 10th Floor
Stamford CT 06901-2682
Tel: 203-327-4500
Fax: 203-327-6401

VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Page 1, lines 13 to 15.

deposited ~~liquid crystal~~ alignment layer. More particularly, the present invention relates to a method of preparing a dry deposited ~~liquid crystal~~ alignment

Page 2, lines 16 to 17.

provide a method of preparing a dry deposited ~~liquid crystal alignment~~ layer by one of mechanical mask,

Page 3, lines 15, to 21.

the dry deposited ~~liquid crystal alignment~~ layer according to the present invention.

Accordingly, the present invention includes a method of preparing a dry deposited ~~liquid crystal alignment~~ layer. The method of preparing a dry deposited ~~liquid crystal alignment~~ layer is selected

Page 4, lines 1 to 14.

filter layer; a first dry deposited ~~liquid crystal alignment~~ layer over the first transparent conductive layer; a second dry deposited ~~liquid crystal alignment~~ layer over the second transparent conductive layer; the second dry deposited ~~liquid crystal alignment~~ layer being spaced adjacent to and facing the first dry deposited ~~liquid crystal alignment~~ layer; a plurality

of uniformly sized transparent or non-transparent spacers distributed within the space; and a liquid-crystal material disposed in the space therebetween.

-Each one of the first alignment layer and the second alignment layer is divided into a plurality of pixels each having a boundary and at least two domains. Each of the multi-domain, dry deposited ~~liquid-crystal alignment~~ layers is obtained by a method selected from

Page 5, lines 2 to 20.

therebetween. Each of the multi-domain, dry deposited ~~liquid-crystal alignment~~ layers is obtained by a method selected from one of mechanical mask, photo-resist, UV treatment, and ridge and fringe field methods.

The present invention further includes an improved method over the prior art methods of preparing an in-plane switching mode liquid-crystal display having the steps of forming a first polyimide alignment layer and a second polyimide alignment layer, wherein each of the first and second layers is rubbed with a mechanical roll wrapped in a velvet cloth. The improvement comprises the steps of: forming a first dry deposited alignment layer; forming a second dry deposited alignment layer; spacing the first dry deposited alignment layer and the second dry deposited alignment layer adjacent to and facing each other; and filling a liquid-crystal material in the space therebetween; wherein each of the dry deposited ~~liquid-crystal alignment~~ layers is obtained by one of: mechanical

Page 6, lines 3 to 9.

substrate so that when operated, the molecules of the liquid-crystal material are switched to rotate in the substrate plane; a first dry deposited ~~liquid-crystal alignment~~ layer over the bottom substrate and the comb-like electrodes; a second dry deposited ~~liquid-crystal alignment~~ layer over the color filter layer; the second dry deposited liquid-crystal alignment layer being spaced adjacent to and facing the first dry deposited
~~liquid-crystal alignment~~ layer; a plurality of

Page 8, line 29.

Preparing a dry deposited ~~liquid-crystal alignment~~

Page 20, lines 28 to 30.

~~liquid-crystal alignment~~ layer, a second dry deposited ~~liquid-crystal alignment~~ layer adjacent to and facing the first dry deposited ~~liquid-crystal alignment~~ layer;

Page 21, lines 4 to 5.

Each of the multi-domain, dry deposited ~~liquid-crystal alignment~~ layers is obtained by one of the following

Page 23, lines 5 to 14.

deposited ~~liquid-crystal alignment~~ layer 83, a second
dry deposited ~~liquid-crystal alignment~~ layer 94 being spaced adjacent to and facing the first dry deposited ~~liquid-crystal alignment~~ layer 83, a plurality of uniformly sized transparent or non-transparent spacers
96 distributed within the space, a liquid-crystal

material 95 disposed in the space between the alignment layers. The spacers can be pearl or post shaped.

Preferably, dry deposited ~~liquid crystal alignment~~

IN THE CLAIMS:

The claims have been amended as follows:

1. (Amended) A method of preparing a multi-domain liquid-crystal display, display which is operable in the in-plane switching mode, comprising the steps of:

depositing a dry deposit alignment layer on a substrate; and

aligning said dry deposited layer using at least two methods ~~dry deposited liquid-crystal alignment layer, by at least one method~~ selected from the group consisting of: mechanical mask, photo-resist, UV treatment, and ridge and fringe field~~;~~

~~wherein said dry deposited liquid-crystal alignment layer is exposed to a particle beam; and~~

~~wherein said particle beam is directed at said dry deposited liquid-crystal alignment layer at an adjustable angle with respect to said dry deposited liquid-crystal alignment layer~~.

4. (Amended) The method of claim 1, wherein said photo-resist method comprises:

depositing on a transparent conductive layer on a substrate a material to form ~~a~~ said dry deposited layers;

partitioning said dry deposited layers into first domain areas and second domain areas of the dry deposited layers;

bombarding said dry deposited layers with a first ion beam; thereafter

covering said first domain areas of said dry deposited layers with a mask leaving said second domain areas open;

bombarding said second domain areas with a second ion beam; and

removing said mask.

9. (Amended) A multi-domain, wide viewing angle liquid-crystal display, comprising:

a bottom substrate having a first surface;

a first transparent conductive layer disposed over said first surface of said bottom substrate;

a top substrate having a second surface;

a color filter layer disposed over said second surface of said top substrate;

a second transparent conductive layer disposed over said color filter;

a first dry deposited ~~liquid-crystal alignment~~ layer over said first transparent conductive layer;

a second dry deposited ~~liquid-crystal alignment~~ layer over said second transparent conductive layer; said second dry deposited ~~liquid-crystal alignment~~ layer being spaced adjacent to and facing said first dry deposited ~~liquid-crystal alignment~~ layer;

a plurality of uniformly sized transparent or non-transparent spacers distributed within said space; and

a liquid-crystal material disposed in the space therebetween;

wherein each of said first ~~alignment~~ dry deposited- layer and said second ~~alignment~~ dry deposited- layer is divided into a plurality of pixels each having a boundary and at least two domains; wherein each of said multi-domain, dry deposited ~~liquid-crystal alignment~~ layers is obtained by a method selected from the group consisting of: mechanical mask, photo-resist, UV treatment, and ridge and fringe field methods,

wherein said dry deposited ~~liquid-crystal alignment~~ layers are ~~is~~ exposed to a particle beam; ~~and~~

wherein said particle beam is directed at said dry deposited ~~liquid-crystal alignment~~ layers at an adjustable angle with respect to said dry deposited ~~liquid-crystal alignment~~ layers, and

wherein said liquid-crystal display is operable in the in-plane switching mode.

10. (Amended) The multi-domain, wide viewing angle liquid-crystal display of claim 9, wherein said domains of said first and said second dry deposited ~~liquid-crystal alignment~~ layers are obtained by mechanical mask method.

11. (Amended) The multi-domain, wide viewing angle liquid-crystal display of claim 10, wherein said mechanical mask method comprises:

depositing on a substrate a material to form a transparent dry deposited ~~alignment~~ layer;

masking said dry deposited layer into first domain areas and second domain areas of the dry deposited layer with a mask; and

selectively bombarding said dry deposited layer with an ion beam through said mask.

18. (Amended) The multi-domain, wide viewing angle liquid-crystal display of claim 9, wherein said domains of said first and said second dry deposited ~~liquid-crystal alignment~~ layers are obtained by photo-resist method.

22. (Amended) The multi-domain, wide viewing angle liquid-crystal display of claim 9, wherein said domains of said first and said second dry deposited ~~liquid-crystal alignment~~ layers are obtained by said UV treatment method.

26. (Amended) The multi-domain, wide viewing angle liquid-crystal display of claim 9, wherein said domains of said first and said second dry deposited ~~liquid-crystal alignment~~ layers are obtained by said ridge and fringe field method.

29. (Amended) An improved method of preparing a liquid-crystal display of the type having the steps of forming a first dry deposited ~~alignment~~ layer, forming a second dry deposited ~~alignment~~ layer, spacing the first dry deposited ~~alignment~~ layer and the second dry deposited ~~alignment~~ layer adjacent to and facing each other and filling a liquid-crystal material in the space therebetween, wherein the improvement comprises the steps of:

forming a first multi-domain dry deposited ~~alignment~~ layer;

forming a second multi-domain dry deposited ~~alignment~~ layer;

spacing said first multi-domain dry deposited ~~alignment~~ layer and said second multi-domain dry deposited ~~alignment~~ layer adjacent to and facing each other; and

filling a liquid-crystal material in the space therebetween;

wherein each of said multi-domain, dry deposited ~~liquid-crystal alignment~~ layers is obtained by a method selected from the group consisting of: mechanical mask, photo-resist, UV treatment, and ridge and fringe field, and

wherein said liquid-crystal display is operable in the in-plane switching mode.

30. (Amended) An improved method of preparing an in-plane switching mode liquid-crystal display of the type having the steps of forming a first polyamide alignment layer and a second polyamide alignment layer, wherein each of the first and second layers is rubbed with a mechanical roll wrapped in a velvet cloth, wherein the improvement comprises the steps of:

forming a first dry deposited alignment layer;

forming a second dry deposited ~~alignment~~ layer;

spacing said first dry deposited ~~alignment~~ layer and said second dry deposited ~~alignment~~ layer adjacent to and facing each other; and

filling a liquid-crystal material in the space therebetween;

wherein each of said dry deposited ~~liquid-crystal alignment~~ layers is obtained by a method selected from the group consisting of: mechanical mask, photo-resist, UV treatment, and ridge and fringe field;

wherein said dry deposited ~~liquid-crystal alignment~~ layer is exposed to a particle beam; ~~and~~

wherein said particle beam is directed at said dry deposited ~~liquid-crystal alignment~~ layer at an adjustable angle with respect to said dry deposited liquid-crystal alignment layer, and

wherein said liquid-crystal display is operable in the in-plane switching mode.

31. (Amended) A wide viewing angle in-plane switching mode liquid-crystal display, comprising:

a bottom polarizer;

a bottom substrate;

a top polarizer;

a top substrate;

a color filter layer disposed over a surface of said top substrate;

a plurality of common electrodes disposed in the bottom substrate plane and a plurality of pixel electrodes disposed in a staggering relationship therewith to form a comb-like structure for producing an electric field parallel to plane of said bottom substrate so that when operated, the molecules of said liquid-crystal material are switched to rotate by said vertical electric field in a direction parallel to the substrate surface;

a first dry deposited ~~liquid-crystal alignment~~ layer over said bottom substrate and said comb-like electrodes;

a second dry deposited ~~liquid-crystal alignment~~ layer over said color filter layer; said second dry deposited ~~liquid-crystal alignment~~ layer being spaced adjacent to and facing said first dry deposited ~~liquid-crystal alignment~~ layer;

a plurality of uniformly sized transparent or non-transparent spacers distributed within said space; and

a liquid-crystal material disposed in the space therebetween;

wherein said dry deposited ~~liquid-crystal alignment~~ layer is exposed to a particle beam; ~~and~~

wherein said particle beam is directed at said dry deposited ~~liquid-crystal alignment~~ layer at an adjustable angle with respect to said dry deposited ~~liquid-crystal alignment~~ layer,

wherein said dry deposited layers are aligned by a method selected from the group consisting of: mechanical mask, photo-resist, UV treatment, and ridge and fringe field, and

wherein said liquid-crystal display is operable in the in-plane switching mode.

32. (Amended) The liquid-crystal display of claim 31, wherein said method of obtaining each of said dry deposited ~~liquid-crystal alignment~~ layers comprises: treating a dry deposited layer with an ion beam in a direction making from about 10 to about 20 degree angle with the plane of the electrodes.

34. (Amended) The liquid-crystal display of claim 1, wherein said particle beam in is directed at said dry deposited ~~liquid-crystal alignment~~ layer at an angle from about 10 to about 20 degree angle with the plane of the electrodes.

35. (Amended) The liquid-crystal display of claim 9, wherein said particle beam in is directed at said dry deposited ~~liquid-crystal alignment~~ layer at an angle from about 10 to about 20 degree angle with the plane of the electrodes.

36. (Amended) The liquid-crystal display of claim 30, wherein said particle beam in is directed at said dry deposited ~~liquid-crystal alignment~~ layer at an angle from about 10 to about 20 degree angle with the plane of the electrodes.